L. C. HANSON COMPANY

CONSULTING ENGINEERS & SURVEYORS

HELENA – GREAT FALLS – GLENDIVE

P.O. Box 299
Lower Level — 3108 McHugh Drive
Helena, Montana 59624

FINAL REPORT

GRUNST-JENNISON MINE PROJECT
RICHLAND COUNTY, MONTANA

DECEMBER 1986

Prepared for: MR. RICHARD JUNTUNEN, CHIEF
Abandoned Mine Reclamation
Bureau
Department of State Lands
1625 11th Avenue
Helena, MT 59620

Prepared by: L. C. HANSON COMPANY
Consulting Engineers
3108 McHugh Lane
PO Box 299
Helena, MT 59624

TOM KLEMPEL, E-I-T
Project Engineer

DAVE MCCLOY
Project Inspector

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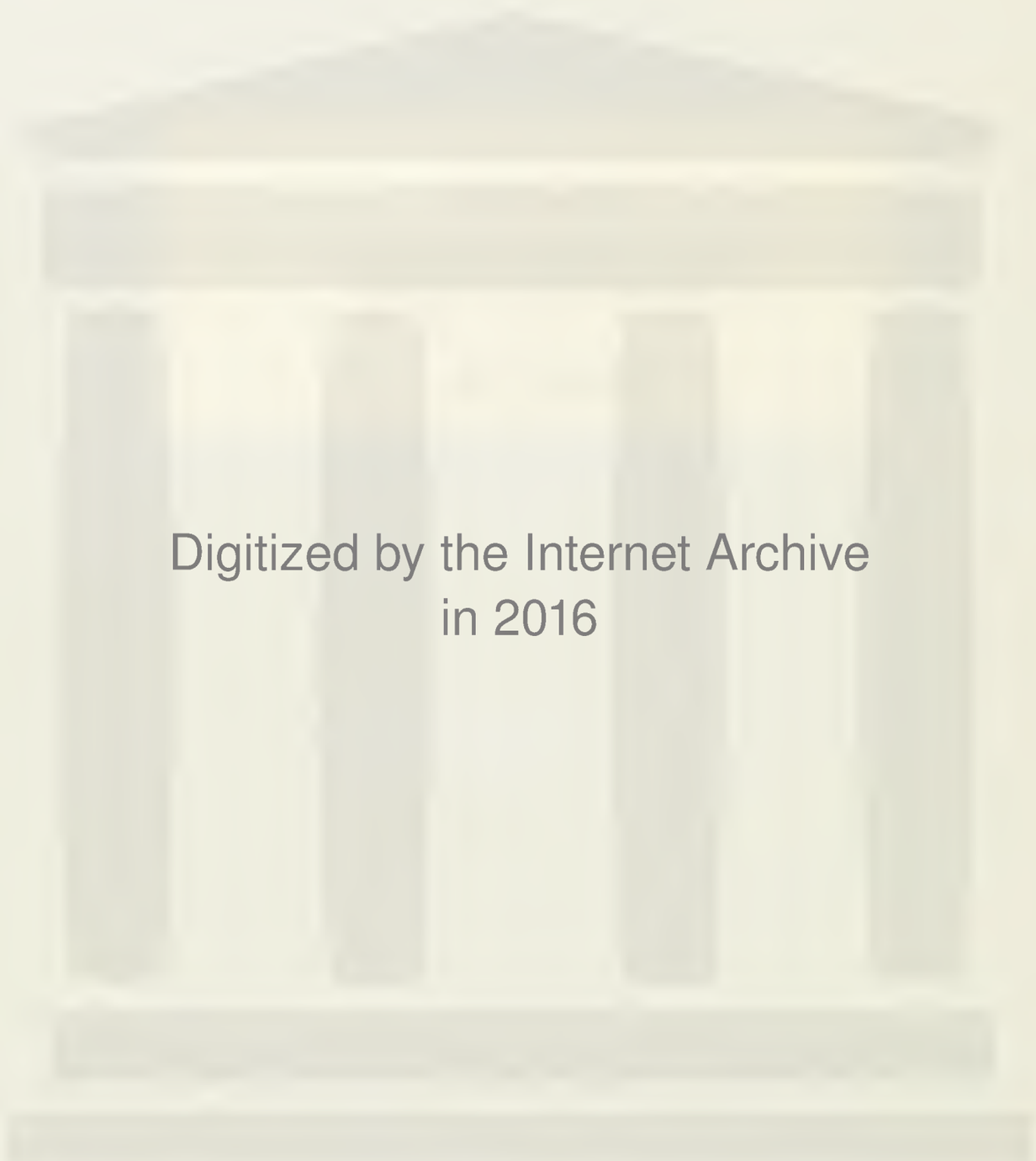

FINAL REPORT
GRUNST-JENNISON MINE
RECLAMATION PROJECT

I. INTRODUCTION

A. PROJECT OBJECTIVES:

The Grunst-Jennison Mine Reclamation Project was undertaken at the site of a partially collapsed abandoned coal mine for the purpose of eliminating discernible hazards to public safety and returning the surface of the mined area to a condition similar to the surrounding undisturbed environment.

B. PROJECT LOCATION:

The Grunst-Jennison Project is located six miles south of Culbertson, Montana in Richland County. The Project includes abandoned mines at three locations.

Grunst-Jennison:	West 1/2 of Section 17, T27N, R56E
Bemer Mine:	South 1/2 of Section 18, T27N, R56E
Park Mine:	Northwest 1/4 of Section 18, T27N, R56E

C. SITE DESCRIPTION:

The Grunst-Jennison Mine site encompasses mining operations at three different locations, while the Park Mine and Bemer Mine sites encompass only one operation each.

The Grunst-Jennison Mine is located about one mile south of a county road which lies along the southern shore of the Missouri River; the Park and Bemer Mines are located a mile west of the Grunst-Jennison Mine and a mile south of the same county road. These mine sites are situated in the midst of the Missouri River Breaks. The terrain is very rugged and sparsely vegetated. Native grasses, juniper, cedar and sagebrush inhabit this area, which is used as cattle rangeland.

Grunst-Jennison Mine:
The three locations of the unrelated mining operations at the Grunst-Jennison Mine lie along an east-west line approximately 2/10 of a mile apart. The debris, slack piles and subsidence holes appear to indicate that the east workings are the oldest, with the work proceeding to the west.

East Workings: The adit at the East Workings was a horizontal shaft entering an east slope from an adjacent channel. This adit had been well sealed and only a few boards and a small slack pile indentified the location. Surface features resulting from the collapse of the workings included slump areas and subsidence holes.

The largest slump, approximately 200 ft. by 80 ft. and varying in depth from 3 to 6 ft., occured atop the hill immediately west of the adit. Earth settlement, fissures along the east periphery, and the absence of vertical earth shear characterized the feature. The apparent stability of this slump is attributed to its vicinity, rather than the stability of the underlying area. In this vicinity there is nearly 80 ft. of overburden and only a small area, beyond the slump perimeter, contributing water runoff.

Most of the subsidence features occurred along the west slope of this same hill. Slump areas and subsidence holes varied in area from 500 to 3000 sft. with depths from 4 to 15 ft. Only one area in the south portion of the workings showed signs of recent collapse and erosion; this feature was located in an adjacent drainage channel and consisted of a slump area with a subsidence hole near its center. A profusion of undergrowth and trees attested to the advanced age and stability of other subsidence features in this area.

Two holes north of the large slump showed the most recent collapse. The hole furthest north was about 20 ft. in diameter and 15 ft. deep and had a 3 ft dia. hole along its north wall, which possibly had contact with the workings.

Middle Workings: Mine related features at these workings included two horizontal adits, a vertical air shaft and large amounts of debris in the drainage channel to the west. One adit was located in the east slope of a hill and the other in west slope of the same hill, about 350 ft. apart. The air shaft was located at the northern crest of the hill and about 130 ft. west of the east entrance. Both adits had either collapsed or had been sealed; however, the 2 ft. dia. air shaft remained open to a depth of 40 ft. Debris included several small buildings, a loading foundation and conveyor. Surface features at these workings included slump areas and subsidence holes. These features were much more recent than those found at the East Workings.

Two prominent slumps resulted here. One was located at the crest of the hill 100 ft. SW of the air shaft; it was very similar to the slump at the East Workings. The other was unique in that it had apparently resulted from the collapse of a room at the base of the hill adjacent to the east entrance. Because the hill consisted of sandy clay at a 2:1 slope, the collapse allowed the face of the hill to slide across an area 150 ft. long and 60 ft. high. The earth piled at the base remained highly unstable.

Nearly all of the subsidence holes at this workings layed along the east slope of this hill. Holes ranged in area from 100 sft. to 2000 sft. and in depths from 5 to 15 ft. Many holes were marked by fresh signs of collapse and erosion.

West Workings: Mine related features related to these workings included several building foundations, loading dock, numerous coal cars and scattered debris. All other mine features were obliterated in a successful effort to extinquish a mine fire in 1959. Surface features at this workings included three minor subsidence holes west of the adit area and about a one acre area surrounding the former adit, which had been disturbed during the fire extinquishing efforts.

These efforts were of a single-minded nature, while successful in controlling the mine fire, they apparently did not include reclamation of the borrow source surrounding the adit. This area was deeply rutted from water erosion and almost devoid of vegetation.

Two subsidence holes were found south of the West Workings. It could not be determined whether these were part of one of the areas already discussed or represent an unidentified mine.

BEMER MINE:
The Bemer Mine had two adits; both were located in an eastern embankment, in separate gorges. The south adit and an air shaft, to the south and above the adit, had been closed previous to this project and remained well sealed; however, the north adit had only partially collapsed and access to the workings was still possible. No apparent effort had at been made to reclaim the surrounding area at either the south adit or air shaft. Much debris remained partially buried at the adit and a 1000 ft. long trail had been dozed through steep terrain to gain access to the air shaft. All areas where work had been performed previous to this project remained greatly eroded and without significant vegetation.

PARK MINE:
The Park Mine had been successfully closed and revegetated previous to this project and only minor amounts of debris remained.

II. DESCRIPTION OF RECLAMATION PROJECT

A. PROJECT PLANNING:

ADMINISTRATION AND FUNDING:
Funding for the reclamation, planning and administration of the GRUNST-JENNISON MINE RECLAMATION PROJECT was provided through a grant from the United States Department of Interior, Office of Surface Mining . The Montana Department of State Lands, Abandoned Mine Reclamation Bureau administered the grant. L.C.Hanson Co. prepared the reclamation plan and also administered the construction Contract, performed on-site inspection of construction and acted as the Department of State Lands on-site representative.

PRELIMINARIES:
Planning for this project was based on site visits and aerial and ground photography. The Dept. of State Lands conducted the initial site investigation in 1983. The result of this and later visits was aerial photos which were used to produce topographic mapping. An historical review was also conducted during these investigations to insure that artifacts of historical significance were not inadvertantly lost or destroyed during reclamation.

In 1984, members of L.C.Hanson Co. visited the site to identify and verify features which appeared on the topo map. They also made a courthouse records search in Sidney, Mt. to verify the legal discription of the project area and identify the titled landowners. Using information gleaned from the courthouse search and historical report, they were able to contact and interview people who had personal knowledge of these mines.

L.C.Hanson Co. commenced compilation of preliminary engineering plans in mid February of 1985. This work included a site visit from the designer and a survey party to verify the topographic and planimetric scale of the mapping. In early April, 1985, the preliminary plan was finished and a "plan in hand" review was made at the various sites. The final engineering was completed and the bid documents and contract fully assembled in early June, 1985.

B. PROJECT SCOPE:

The reclamation prescribed for the GRUNST-JENNISON MINE RECLAMATION PROJECT included: debris disposal; salvaging and replacing topsoil in all work areas; closing all adits and air shafts; backfilling subsidence holes and slump areas; regrading eroded areas; and re-establishing vegetation throughout all disturbed areas.

C. THE RECLAMATION PLAN:

The GRUNST-JENNISON reclamation plan divided the project into two work areas: the Grunst-Jennison Mine and the Bemer-Park Mine.

GRUNST-JENNISON:
Work Areas: The Grunst-Jennison Mine was further divided into four work areas and eleven backfill areas.

Area #1:	Encompassed the majority of the Middle Workings including all subsidence holes along the east slope and both slump areas.
Area #2:	Encompassed the site of a building foundation located west and adjacent to Area #1. It was designated for equipment parking and sanitation facility.
Area #3&#4:	Encompassed the disturbed area surrounding the adit at the West Workings.
Backfill Areas:	Designated Subsidence Backfill Areas included: four subsidence holes in the East Workings; three holes adjacent to Area #1; two holes between the Middle and West Workings; and three holes west of the West Workings. (1)

1. Subsidence holes designated for work showed signs of recent collapse. Those holes not included appeared heavily vegetated and stable.

Work Items:

Construct Crossings:	Upgrade two crossings on the access road between the county road to the north and the mine.
Debris Cleanup:	Gather all debris. Burn or dispose off-site all biodegradable debris. Bury all debris.
Structure Removal:	Obliterate three wood frame buildings, two concrete foundations, and two concrete loading docks.
Close Mine Opening-Shaft:	Backfill the air shaft in the Middle Workings with rock or concrete rubble.
Provide Water:	Provide and spread water for compaction in fill areas, dust control and road maintenance.
Salvage Topsoil:	Excavate, stockpile and spread topsoil in areas where backfilling and/or regrading is performed.
Provide Topsoil:	Haul topsoil from Area #1 to Area #3 and #4.
Subsidence Backfill:	Backfill designated subsidence holes with material cut and hauled from Area #1.
Subsidence Grading:	Regrade Area #1 to fill all subsidence holes within its boundries and compact and reshape both slump areas.
Regrade Area:	Recontour Area #3 and #4.
Revegetate:	Apply fertilizer and hydraulically apply seed and mulch to all disturbed areas.
Fence:	Construct barbed wire fences to enclose Area #1 and Area #3 and #4.

BEMER-PARK MINE: Work items:

Debris Cleanup:	Excavate a burial pit at the south adit. Burn or dispose off-site all biodegradable debris. Bury all debris.
Structure Removal:	Obliterate one wood frame building and foundation and one tipple. Dispose of remains as debris.
Close Mine Opening-Adit:	Backfill the north adit at the Bemer Mine and regrade the area surrounding the adit.
Provide water:	Provide and spread water for compaction in fill areas, dust control and road maintainance.
Salvage Topsoil:	Excavate, stockpile and spread topsoil in areas where backfilling and/or regrading is performed. Redistribute the topsoil salvaged at the north adit to cover the south adit.
Reclaim Trail:	Regrade the access trail to the air shaft and install erosion control dikes across the north end of the trail.
Revegetate:	Apply fertilizer and hydraulically apply seed and mulch to all disturbed areas.
Fence:	Construct barbed wire fences to enclose the south adit and the north adit.

D. CONSTRUCTION PHASE:

SCHEDULE OF EVENTS:
The following delineation of events tracks the construction phase of the project from bidding to final completion.

August 13, 1985:	The Montana Department of Administration issues an invitation for bids.

August 22, 1985: L.C.Hanson Co. conducts a Prebid Conference at the site. A representative of the Department of State Lands and representatives from ten construction firms are in attendance.

September 3, 1985: The landowner of the NE1/4 of the SW1/4 informs L.C.Hanson Co. that he will not permit use of that portion of the existing Grunst-Jennison access road which crosses his property.

September 4, 1985: The Department of Administration opens the four bids recieved.

September 13, 1985: L.C.Hanson Co. files an application with the Bureau of Land Management to relocate the access to the Grunst-Jennison Mine on Federal Land to the west of the existing road.

September 16,1985: A Notice of Award is issued to Jones Construction Service Inc., Sidney, Mt. as the successful low bidder.

September 25, 1985: L.C.Hanson Co. conducts a Preconstruction Conference at the site. Attendees include representatives of the Department of State Lands; Department of Interior, Bureau of Land Management; L.C.Hanson Co.; and Jones Construction Service.
A Notice to Proceed was issued to Jones Construction Service, they having successfully met all bonding and insurance requirements.

September 27,1985: Department of Interior, Bureau of Land Management issues verbal consent for access across federal property.

October 1,1985: Construction commences.

October 28, 1985: Department of Interior, Bureau of Land Management issues witten consent for access across federal property.

November 11,1985: L.C.Hanson Co. issues Jones Construction Service a Notice of Temporary Shutdown for the duration of the winter.

May 29,1986: Jones Construction Service resumes work on the project.

June 18,1986: L.C.Hanson Co. conducts a final inspection of the completed project.

July 18,1986: The project is accepted as complete and Final Payment is made.

E. EQUIPMENT:

Backhoe:	John Deere 690, track mounted, hydraulic, 3/4 CYD
Dozer:	Terex 8220, track mounted, 12 ft. blade
Front Loader:	Terex 7231, tire mounted, 3CYD
Water Truck:	Truck mounted tank, 1635 GAL
Scraper:	Terex TS-14B, twin engine, 15 CYD

F. WORK DESCRIPTION:

Grunst-Jennison: Work commenced at the Grunst-Jennison Mine with the relocation of the access road to an existing trail. This involved using a dozer to upgrade the trail at several locations.

The backhoe was used to obliterate structures and the front loader used to gather debris and backfill the air shaft with concrete rubble. After the backhoe had salvaged the topsoil from several deep subsidence holes the debris was burned and buried in these holes.

While the backhoe continued to salvage topsoil from subsidence holes, the scraper and dozer were used to salvage topsoil from Area #1 and recontour Area #3 and #4. When recontour was complete the scraper hauled topsoil from Area #1 to Area #3 and #4. Topsoil salvaged from the subsidence holes totaled approximately 349 CYD and topsoil from Area #1 approximately 2764 CYD. About 683 CYD was delivered to Area #3 and #4.

After topsoil salvage in Area #1 was completed, the scraper was used to haul approximately 1691 CYD of borrow material from Area #1 to the designated subsidence holes. About 6400 Gal of water was added to the fill material to assist in the compaction effort.

Because of the steep slopes, the dozer was used in the slumped area on the north end of Area #1 to recontour and compact the loose material and spread topsoil.

Bemer-Park: After the above work was completed, operations were moved to the Bemer-Park Mine. A burial pit was excavated at the south adit, debris gathered, structures obliterated, and debris burned and buried.

The dozer was used to close the south adit and recontour the area. The topsoil salvaged at the adit was insufficient to cover the adit work and the debris pit; therefore, a topsoil borrow area was established at the Park Mine. The scraper and loader were used to haul approximately 307 CYD of topsoil from the borrow to the adit and pit area.

In addition to the Contract, the Department of State Lands decided to include in the work the closing of an adit 1/4 mile south of the Bemer Mine. Also, the Bureau of Land Management required the installation of erosion control dikes on the drainage channel below the north adit. The dozer was used to close the additional adit and the front loader was used to deliver and place dikes of scoria at the north adit.

The dozer was used to backdrag the air shaft access trail and install erosion control dikes.

Work in General: A truck mounted fertilizer spreader applied fertilizer to all disturbed areas. Hydraulic application of the seed and mulch commenced at the Bemer-Park Mine and proceeded to the Grunst-Jennison Mine. Approximately 1/3 of the total mulch required was applied with the seed. Before applying the remaining mulch, the dozer was used to track all seeded areas. Approximately 5 acres were revegetated with this method requiring 457 lbs. of fertilizer, 223 lbs. of seed and 9000 lbs. of mulch.

Shortly after these items of work were completed the project was shut down for the winter. The fence was installed after the project resumed in the spring. The fencing included 3837 Lft. of fence, 12 single panel units, 21 double panel units, and 6-16 Lft. wire gates.

A total of 35 calendar days were used to complete the project. 30 of these days were used between October 1 and November 11. 11 weather days were granted during this period due to rain and snow.

III. COST AND QUANTITY SUMMARY:

A. FINAL PAYMENT REQUEST AND RECONCILIATION CHANGE ORDER:

A copy of the Final Payment Request and Reconciliation Change Order are contained in Appendix A. These documents summarize the final quantities and costs for each work item.

B. CHANGE ORDERS:

The following Change Orders were executed during the course of the project:

1. A private landowner denied access to an existing road immediately prior to construction startup. For this reason the road was relocated onto BLM property.
2. The remains of a collapsed adit were verified during construction at the Bemer Mine.
3. The prescribed redistribution of topsoil between two work items at the Bemer site did not generate sufficient topsoil to meet the 4-inch minimum depth requirements; therefore, a topsoil borrow source was established at the Park Mine.
4. Access to the Bemer adit was made through a narrow canyon. BLM officials reviewed the reclamation of the access and prescribed the construction of erosion control bars to prevent erosion of the drainage channel.

C. COST DELINEATED BY WORK AREA

Table 1 below shows the work location, work items, area and costs involved in the Grunst-Jennison Mine Reclamation Project.

WORK AREA	WORK ITEM COST:DOLLARS	TOTAL COST	AREA ACRES	COST /ACRE
Entire Project	MOBILIZATION LUMP SUM:	$1500.00	4.95	$303.03
Grunst-Jennison Entire site:	DEBRIS CLEANUP LUMP SUM:	2500.00	4.05	617.22
	REVEG-ETATION **TOP-SOIL** **OTHER**			
6-Structures Removed:	$550.52 $390.00 LUMP SUM:$1000.00	1940.52	.211	9196.78
Area #1:	5680.06 4324.70 FENCE:2550.40 BACKFILL: 729.75(2) SUBSIDENCE GRADING LUMP SUM:2000.00 CLOSE SHAFT LUMP SUM:1000.00	16,284.91	2.177	7480.00
Area #2:	388.06 221.28 BACKFILL: 54.06(2)	663.40	.149	4411.69
Area #3 & #4	2598.69 1301.30 PROVIDE TOPSOIL:1301.30 FENCE:2245.30 REGRADE AREA LUMP SUM: 500.00	7946.59	.996	7978.20

WORK AREA	WORK ITEM COST: DOLLARS			TOTAL COST	AREA ACRES	COST /ACRE
	REVEG-ETATION	TOP-SOIL	BACK-FILL(2)			
Subsidence Holes: #1:	$176.37	$255.14	$571.71	$1000.22	.0676	$14,840.53
#2:	176.37	51.16	544.78	772.31	.0676	11,424.70
#3:	104.79	60.00	216.22	381.01	.0398	9573.12
#3a:	266.73	228.42	334.56	829.11	.102	8128.53
#4,#5 & #6:	INCLUDED IN AREA #1					
#7:	INCLUDED IN AREA #2					
#8:	136.20	103.00	405.42	644.62	.0522	12,349.04
	REVEG-ETATION	TOP-SOIL	OTHER			
ROAD RELOCATION:	533.19	98.68				
	PROVIDE SCORIA: 480.00					
	LUMP SUM: 1200.00			2311.87	.194	11,916.86
Bemer-Park						
Entire site:	DEBRIS CLEANUP					
	LUMP SUM: 3500.00			3500.00	.8996	3890.62
	REVEG-ETATION		OTHER			
Debris Pit:	614.97	FENCE: 1024.90				
	PROVIDE TOPSOIL: 473.70					
	STRUCTURE REMOVAL: 1000.00			3113.57	.2357	13,209.86
North Adit:	187.60	FENCE: 818.70				
	PROVIDE TOPSOIL: 140.60					
	EROSION DIKES: 228.00					
	CLOSE ADIT					
	LUMP SUM: 1500.00			2874.90	.0719	39,984.70

2. The cost of PROVIDE WATER is included in backfill.

WORK AREA	WORK ITEM COST: DOLLARS REVEG-ETATION	OTHER	TOTAL COST	AREA ACRES	COST /ACRE
Shaft Access trail:	$606.14	RECLAIM TRAIL LUMP SUM: $2500.00	$3106.14	.2327	$13,348.26
Additional Adit:	392.88	CLOSE ADIT HOUR RATE: 325.00	717.88	.1417	5066.20
Topsoil Borrow:	617.38		617.38	.2176	2837.22
		TOTAL:	**$50,707.43**		
			.495 acres		
			$10,243.93/acre		

D. COST DELINEATED BY WORK ITEM

Table 2 below shows the work items, quantities, total cost and costs per acre involved in the Grunst-Jennison Mine Reclamation Project.

WORK ITEM:	QUANTITY:	COST (DOLLARS) PER UNIT:	TOTAL:	PER ACRE:
MOBILIZATION	LUMP SUM	$1500.00	$1500.00	$303.03
DEBRIS CLEANUP	LUMP SUM	6000.00	6000.00	1212.12
STRUCTURE REMOVAL	LUMP SUM	2000.00	2000.00	404.04
CONST. CROSSING	LUMP SUM	1200.00	DELETED	
CLOSE MINE OPENING				
SHAFT	1	1000.00	1000.00	
ADIT	1	1500.00	1500.00	20,862.31
PROVIDE WATER	6.4 M/GAL	50.00	320.00	64.64
SALVAGE AND REPLACE				
TOPSOIL	3467.5 CYD	2.00	6935.00	1576.14
PROVIDE TOPSOIL	957.8 CYD	2.00	1915.60	1923.29
RECONTOUR AREA 3&4	LUMP SUM	500.00	500.00	502.00
SUBSIDENCE GRADING	LUMP SUM	2000.00	2000.00	918.70
SUBSIDENCE BACKFILL	1691.0 CYD	1.50	2536.50	7705.04
RECLAIM TRAIL	LUMP SUM	2500.00	2500.00	10,743.45

FERTILIZER	405.8 LBS	$.50	$202.90	$46.11
WORK ITEM:	**QUANTITY:**	**COST PER UNIT:**	**TOTAL:**	**PER ACRE:**
SEED	199.2 LBS	15.00	2988.00	679.09
MULCH	7900.0 LBS	1.05	8295.00	1885.23
FARM FENCE	3837.3 LFT	1.00	3837.30	1102.48
F3 GATE	96.0 LFT	2.00	192.00	55.16
DOUBLE PANEL	21 EACH	90.00	1890.00	543.00
SINGLE PANEL	12 EACH	60.00	720.00	206.86
CHANGE ORDER #1				
ROAD RELOCATION			1916.86	9880.72
ADIT BACKFILL			717.88	5066.20
RECLAIM BORROW			617.38	2837.22
EROSION CONTROL				
BEMER ADIT			228.00	3171.07
		TOTAL:	**$50,707.43**	
			$10,243.93/acre	

IV. SUMMARY

A. ACCOMPLISHMENTS:

This project was successfully completed within the allotted time and within the Engineer's cost estimate. It successfully achieved the objectives of eliminating the discernible hazards to public safety, returned the area to a usable condition, and restored the environment.

The slide and photo presentation, accompanying this report in Appendix B, documents the dramatic changes which occured in various work areas, and the good success of revegetating the areas with hydraulic methods.

The Montana Department of State Lands will continue to monitor the site to determine if additional reclamation is required.

B. ENGINEERS COMMENTS

The environmental setting of the GRUNST-JENNISON MINE RECLAMATION PROJECT made this project unique. Coal mines in Eastern Montana are frequently located in areas reasonably accessible throughout the heating season, because the heating season is precisely when accessibility is most difficult to achieve due to mud and snow. Grunst-Jennison, Bemer and Park Mines were all located in narrow canyons with very steep walls with surface collapse feature occuring on steep side hills.

The terrain required special consideration in designing this project. Most important among these considerations were erosion control, containment of equipment disturbance and construction safety.

As mentioned earlier, the Grunst-Jennison and Bemer Mine displayed examples of reclamation techniques which had no long term goals. The 25 years ensuing that work had contributed only worsening erosion. These examples made it obvious that erosion control was of primary importance.

Containment of equipment disturbance was important because any abuse of this fragile environment could require immediate reclamation or contribute to future problems with erosion.

Construction safety is always a consideration in mine reclamation work because of the obvious hazards of a collapsing mine; however, here the consideration also had to contend with equipment operating on steep unstable slopes.

The hydraulic application of seed and mulch was specified to assist in controlling erosion and eliminated the operation of some equipment on steep slopes. The erosion controlling ability of this method was greatly enhanced with the use of a tackifing agent with the mulch and the tracking of the seeded areas.

The design specifically designated all work areas and all access routes. The work areas and routes were specifically layed out to prevent equipment damage to area that would be difficult to reclaim.

The north end of Area #1 was particularly difficult to design and construct. The area was highly eroded, unstable and steep; these conditions are shown in slides 5, 6, and 7. The design required the compaction of the loose material and the installation of an embankment with a 2:1 slope at the base meeting a 3:1 toward the top. Slides 11 and 12 show the embankment in construction. Note the bench at mid slope; this was used to haul topsoil from this end of the area to a stockpile at the east side and haul borrow material to the embankment. The design specified the hill above the embankment as the sole borrow source for backfill material used throughout the project; this permitted the construction of the 3:1 slope while suppling fill material to other work items. Note the finished slope in slides 14 and 15; note particularly that the trees, shown mid slope in slide 7, remain at the conclusion of construction.

I believe that many aspects of this project are good examples of design that blends well with the environment, cooperation among the many parties involed in the project, and a Contractor who is willing and able to deliver quality craftsmanship. Furthermore,a comparison of the reclamation techniques employed at this site in 1959 and those in 1985 emphasizes the importance of long term goals and clearly substantiates the importance and necessity of the Abandoned Mine Reclamation Program with respect to both public safety and environmental restoration.

V. SLIDES:

The slide logs and slides are contained in Appendix B.

APPENDIX A

LCH Co.

PAYMENT REQUEST NO. Two (2) (Final)

FROM June 1, 1986 TO June 30, 1986

PROJECT NAME GRUNST-JENNISON MINE PROJECT

LOCATION Richland County, Montana PROJECT NO. IFB 6077-G

NAME OF CONTRACTOR JONES CONSTRUCTION ADDRESS Skaar Route Box 4139
Sidney, MT 59270

RECEIVED
JUL 18 1986
LOWELL C. HANSON CO.

SUMMARY OF PROJECT STATUS

Amount of Original Contract	$ 48,838.00
Amount of Approved Change Order(s)	1,869.43
TOTAL CONTRACT AMOUNT	50,707.43
Contract Time Used to Date	35 days
Percentage of Contract Time Used	35/45 = 78%
Percentage of Contract Amount Earned	100%
Original Contract Amount Completed	46,832.30
Change Order(s) Amount Completed	3,875.13
Amount for Materials On Site	-0-
TOTAL To Date	50,707.43
Retainage Withheld (%)	-0-
TOTAL AMOUNT Earned To Date	50,707.43
Less Previous Amount Earned	43,484.06
Amount Payable This Period	7,223.37
Less 1% Gross Receipts Tax	72.23
TOTAL DUE CONTRACTOR THIS PERIOD	7,151.14

Requested By: Jones Construction [signature] (Contractor)

Checked By: L. C. Hanson Company Walter J. Benjamin (Engineer)

Approved By: Montana Dept. of State Lands Susan M. Reilly (Owner)
Abandoned Mine Reclamation Bureau

ITEMIZATION OF QUANTITIES AND COSTS

EM	DESCRIPTION	ESTIMATED PLAN QUANTITY	UNIT PRICE BID	UNITS OF WORK COMPLETED TO DATE	TOTAL COST OF COMPLETED WORK	PERCENT OF ESTIMATED QUANTITY COMPLETED
1.	MOBILIZATION	LUMP SUM	$ 1,500.00	LUMP SUM	$ 1,500.00	100% *
2.	DEBRIS CLEANUP - GRUNST-JENNISON	LUMP SUM	2,500.00	LUMP SUM	2,500.00	100% *
3.	DEBRIS CLEANUP - BEMER/ PARK	LUMP SUM	3,500.00	LUMP SUM	3,500.00	100% *
-.	STRUCTURE REMOVAL	LUMP SUM	2,000.00	LUMP SUM	2,000.00	100% *
.	CONSTRUCT TWO (2) CROSSINGS	LUMP SUM	1,200.00	-0-	-0-	0% *
.	CLOSE MINE OPENING - SHAFT	1 EACH	1,000.00/EA	1 EACH	1,000.00	100% *
.	CLOSE MINE OPENING - ADIT	1 EACH	1,500.00/EA	1 EACH	1,500.00	100% *
.	PROVIDE WATER	70 MGAL	50.00/MGAL	6.4 MGAL	320.00	9.1% *
	SALVAGE AND REPLACE TOPSOIL	3480 C.Y.	2.00/C.Y.	3467.5 C.Y.	6,935.00	99.6% *
-	PROVIDE TOPSOIL	535 C.Y.	2.00/C.Y.	957.8 C.Y.	1,915.60	179% *
-	RECONTOUR AREAS #3 AND #4	LUMP SUM	500.00	LUMP SUM	500.00	100% *
..	SUBSIDENCE GRADING - AREA #1	LUMP SUM	2,000.00	LUMP SUM	2,000.00	100% *
	SUBSIDENCE BACKFILL	1500 C.Y.	1.50/C.Y.	1691.0 C.Y.	2,536.50	112.7% *
	RECLAIM TRAIL	LUMP SUM	2,500.00	LUMP SUM	2,500.00	100% *
	FERTILIZER	342 LBS.	.50/LB	405.8 LB	202.90	118.7% *
	SEED	163 LBS.	15.00/LB.	199.2 LB	2,988.00	122.2% *
	WOOD CELLULOSE FIBER MULCH	7400 LBS.	1.05/LB	7,900 LB	8,295.00	106.8% *
	FARM FENCE - F-#	3400 L.F.	1.00/L.F.	3,837.3 L.F.	3,837.30	112.9% *

-k Completed on This Item

ITEMIZATION OF QUANTITIES AND COSTS

ITEM	DESCRIPTION	ESTIMATED PLAN QUANTITY	UNIT PRICE BID	UNITS OF WORK COMPLETED TO DATE	TOTAL COST OF COMPLETED WORK	PERCENT OF ESTIMATED QUANTITY COMPLETED
19.	F-3 GATE	96 L.F.	$2.00/L.F.	96 L.F.	192.00	100% *
20.	DOUBLE PANELS	24 EACH	90.00/ EACH	21 EACH	1,890.00	87.5 % *
21.	SINGLE PANELS	12 EACH	60.00/ EACH	12 EACH	720.00	100% *
	SUB TOTAL				46,832.30	
	CHANGE ORDER NO. 1					
..	ROAD RELOCATION					
	a. upgrading @ 4 locations	LUMP SUM	1,200.00	LUMP SUM	1,200.00	100% *
	b. provide & place scoria	60 C.Y.	8.00/C.Y.	60 C.Y.	480.00	100% *
	c. salvage & replace topsoil	49.34 C.Y.	2.00/C.Y.	49.34 C.Y.	98.68	100% *
	d. seed	8.36 LBS	15.00/LB	8.36 LBS	125.40	100% *
	e. fertilizer	17.58 LBS	.50/LB	17.58 LBS	8.79	100% *
	f. mulch	380 LBS	1.05/LB	380 LBS	399.00	100% *
..	ADIT BACKFILL					
	a. backfill adit	5 HRS	65.00/HR	5 HRS	325.00	100% *
	b. seed	6.16 LBS	15.00/LB	6.16 LBS	92.40	100% *
	c. fertilizer	12.95 LBS	.50/LB	12.95 LBS	6.48	100% *
	d. mulch	280 LBS	1.05/LB	280 LBS	294.00	100% *
	RECLAIM TOPSOIL BORROW AREA					
	a. seed	9.68 LBS	15.00/LB	9.68 LBS	145.20	100% *
	b. fertilizer	20.35 LBS	.50/LB	20.35 LBS	10.18	100% *
	c. mulch	440 LBS	1.05/LB	440 LBS	462.00	100% *
	d. type F-3 farm fence	620 L.F.	1.00/L.F.	-0-	-0-	0% *
	e. farm fence gate	32 L.F.	2.00/L.F.	-0-	-0-	0% *
	f. single panel	4 EACH	60.00/EACH	-0-	-0-	0% *
	g. double panel	4 EACH	90.00/EACH	-0-	-0-	0% *
	CONSTRUCT EROSION CONTROL BARS - BEMER ADIT	28.5 C.Y.	8.00/C.Y.	28.5 C.Y.	228.00	100% *
	SUB TOTAL				3,875.13	
	TOTAL				50,707.43	

rk Completed on This Item

APPENDIX B

SLIDE AND PHOTO LOG

SLIDES: Grunst-Jennison

No.	Description
1&2	Drainage channel west of Area #1 taken prior to construction. Note the debris in the drainage bottom this marks the location of adit shown in slide 2.
3	Area #3 and #4, looking west, prior to construction.
4-6	Area #1, looking west, prior to construction
7&8	Backhoe, scraper and front loader salvaging topsoil from the north end of Area #1.
9-12	Area #1, from south to north, looking west, during construction.
13-15	Area #1, from south to north, looking west, prior to revegetation.
16-18	Area #2,#3 and #4, looking west, during construction.

Bemer Mine

19	South adit, site of debris pit, looking north.
20-22	South adit, site of debris pit, looking west.
23&26	North adit, looking south west.
24&25	North adit, looking west.

PHOTO: Grunst-Jennison

1	Area #1 prior to construction.
2	Area #1 during construction.
3&4	Area $1 completed.
8	Area #3 and #4 completed.

Bemer and Park Mines

5&7	Topsoil borrow revegetated.
6	North adit prior to construction.

APPENDIX C

ANALYSIS OF PROFESSIONAL SERVICE FEES
DATE OF PREPARATION: November 20, 1986
PROJECT: Grunst/Jennison

PROFESSIONAL SERVICE	AMOUNT
* Data Gathering, Site Evaluation, Preliminary Engineering, Final Engineering, Bidding Documents	$19,913.71
* Construction Administration, Construction Inspection, Final Report Preparation	$21,836.00
L.C. HANSON CO. COSTS	$41,749.71
CONSTRUCTION COSTS	$50,707.43

PERCENTAGE ANALYSIS

PRE-CONST. LCH CO COST/CONSTRUCTION COST	39.27%
CONST. & POST CONST. LCH CO. COST/CONSTRUCTION COST	43.06%
TOTAL LCH CO. COST/CONSTRUCTION COST	82.33%

REMARKS: Services provided include lien determination, landowner consent, budget preparation, grant application, weed board approval, basic engineering, construction staking, contract administration, quantity accounting and full time resident inspection. This project involved three sites and two landowners. The project was shut down over the Winter and involved two construction seasons. An access problem was encountered just prior to contract award and required considerable effort to resolve.